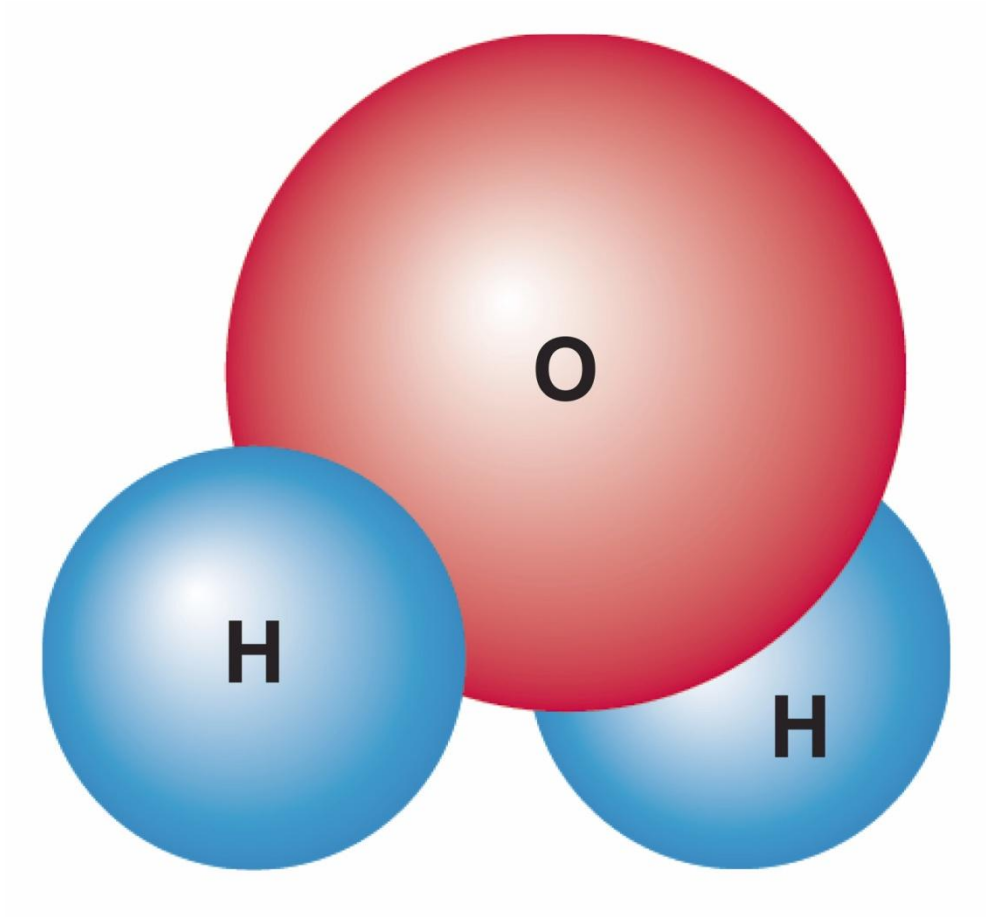
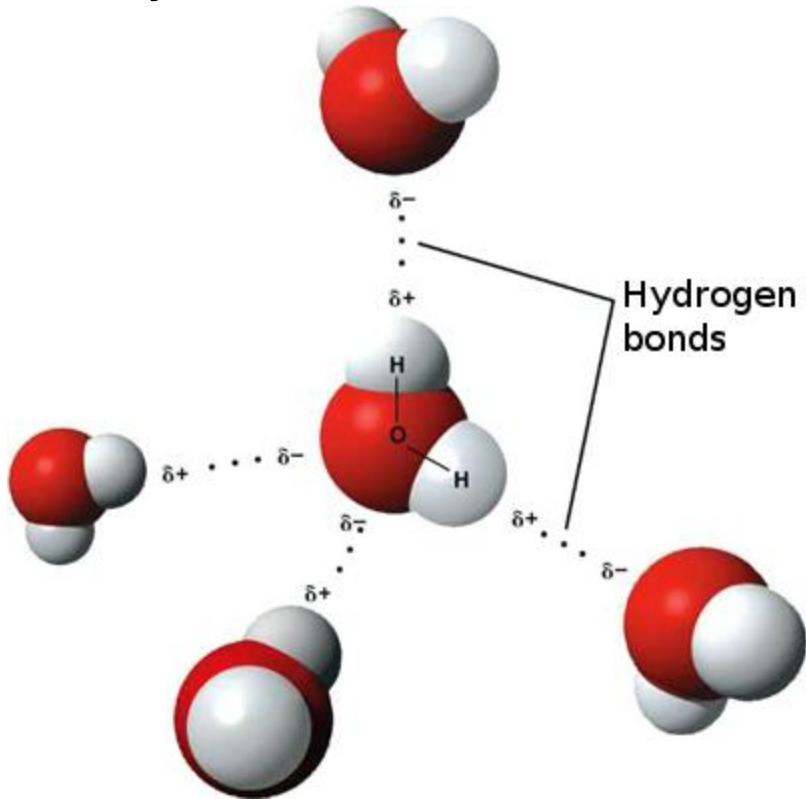


2-2 Properties of Water



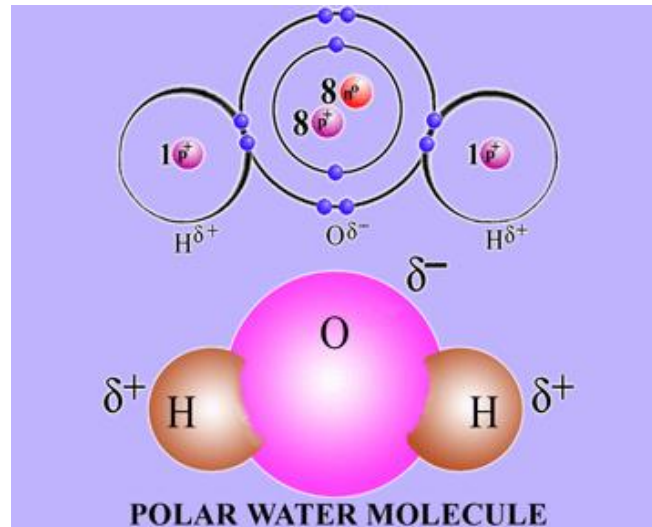
Water

- Water is the most important molecule on earth.
- Because of its unique shape and chemical behavior it easily bonds with other molecules, and itself.

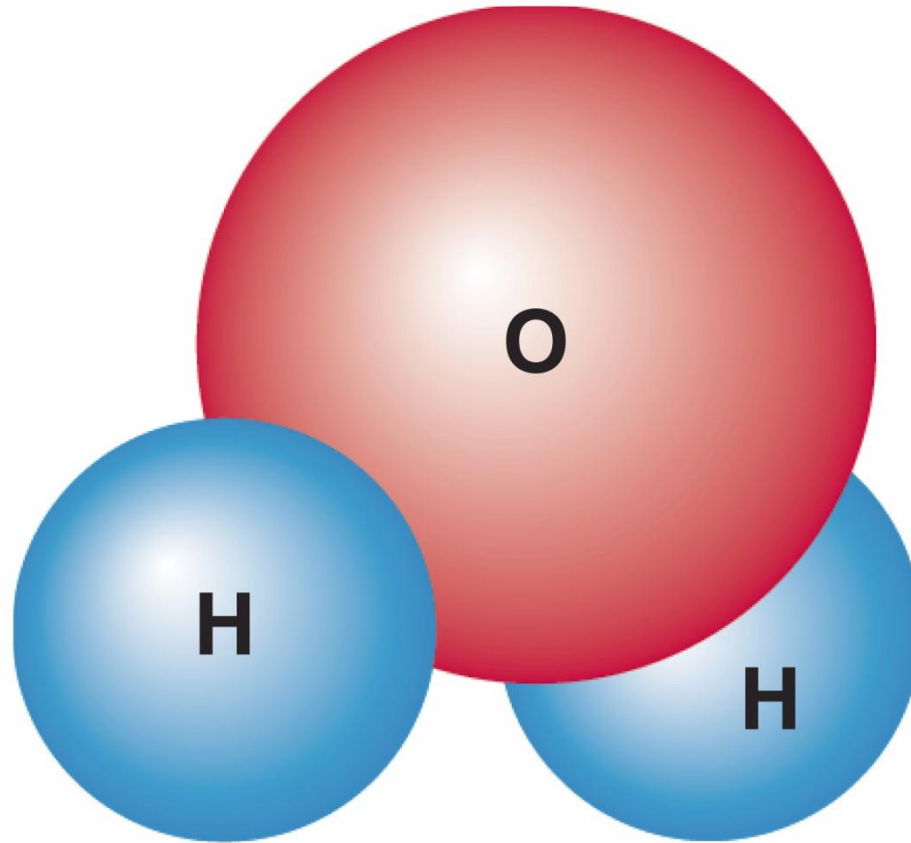


Water: Covalent Bond

- Water molecules are formed by covalent bonds that link 2 hydrogen atoms (H) to 1 oxygen atom (O).
- The ***electrons*** that the hydrogen and oxygen atoms share are not shared equally.
- **Polar = two distinct ends.**
 - A water molecule is polar.

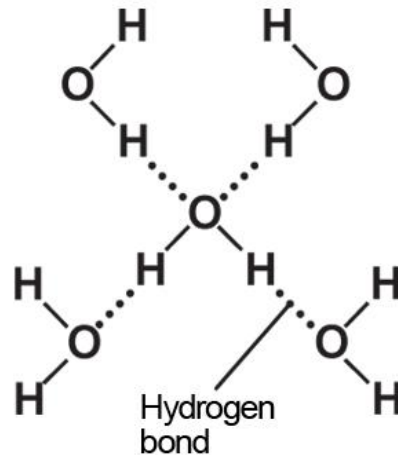
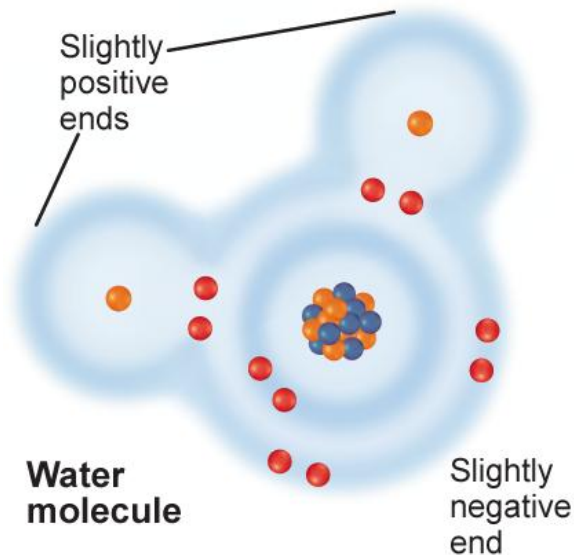


The Water Molecule

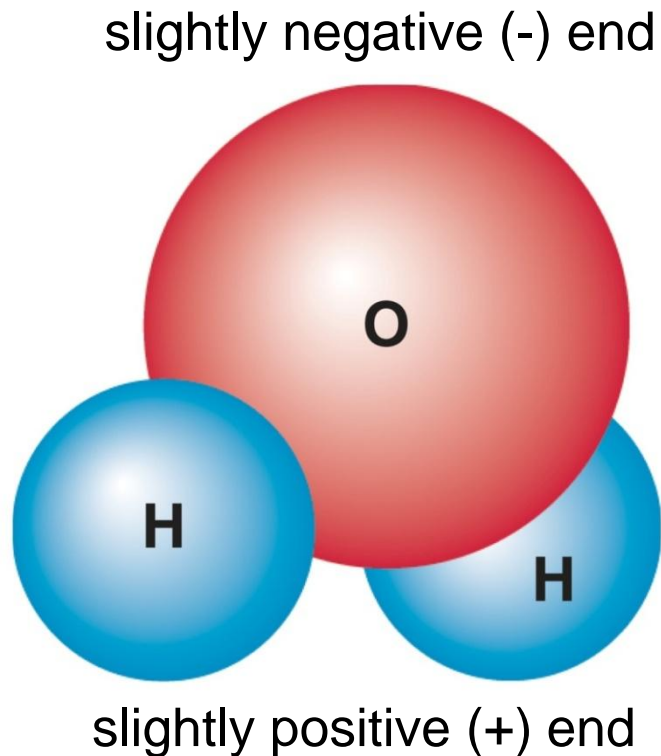


Polarity

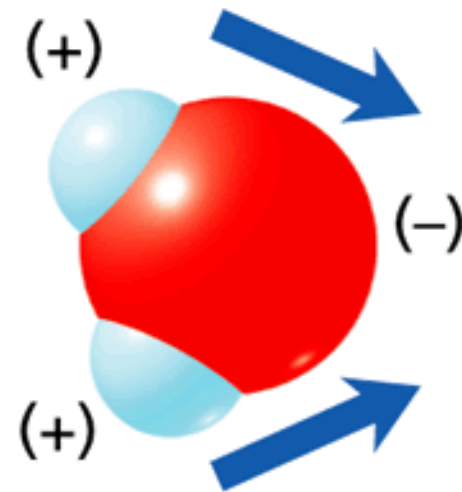
- Protons (+) love electrons (-) (opposites attract).
- Oxygen has more protons in its nucleus (8), so it has a stronger attraction for electrons than the hydrogen atom (only 1 proton).
- Shared electrons are more likely to be near the oxygen atom than near the hydrogen atom.



Since those electrons are more attracted to oxygen, the oxygen end of the water molecule has a slight negative charge and the hydrogen end has a slight positive charge.

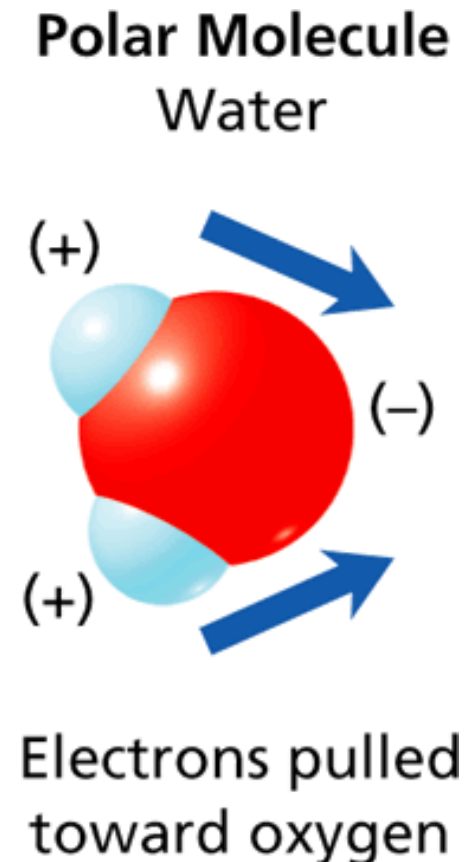
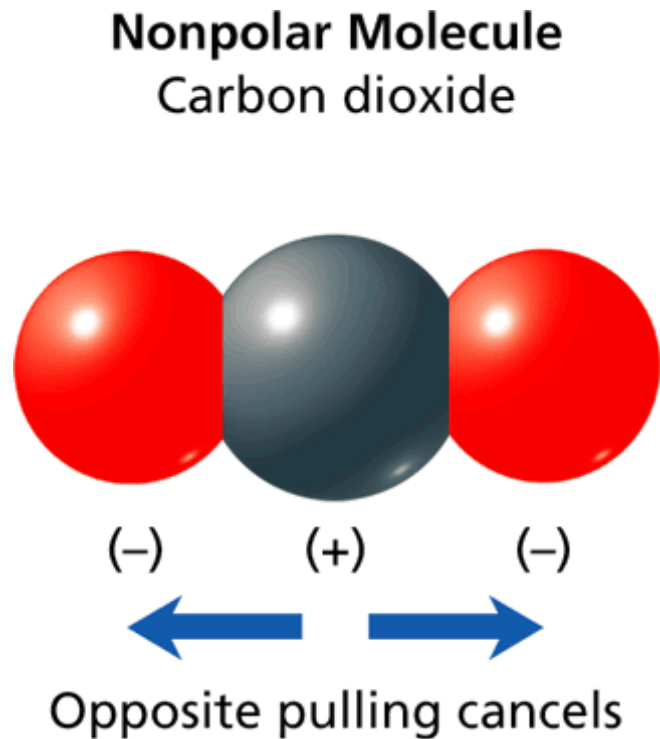


Polar Molecule Water



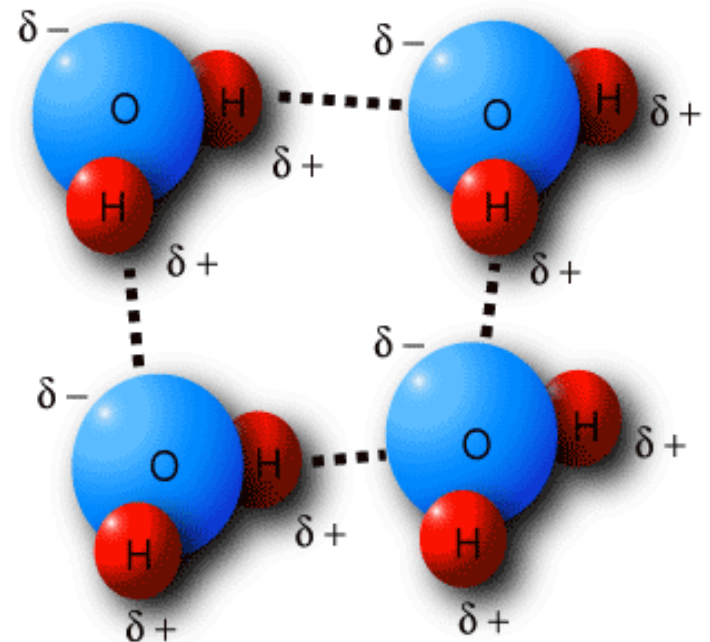
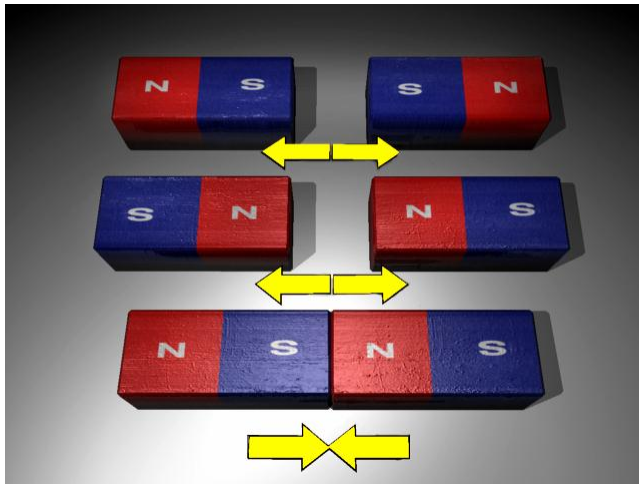
Electrons pulled
toward oxygen

- A **carbon dioxide molecule is nonpolar** (straight line shape).
- A **water molecule is a polar molecule** (bent shape).



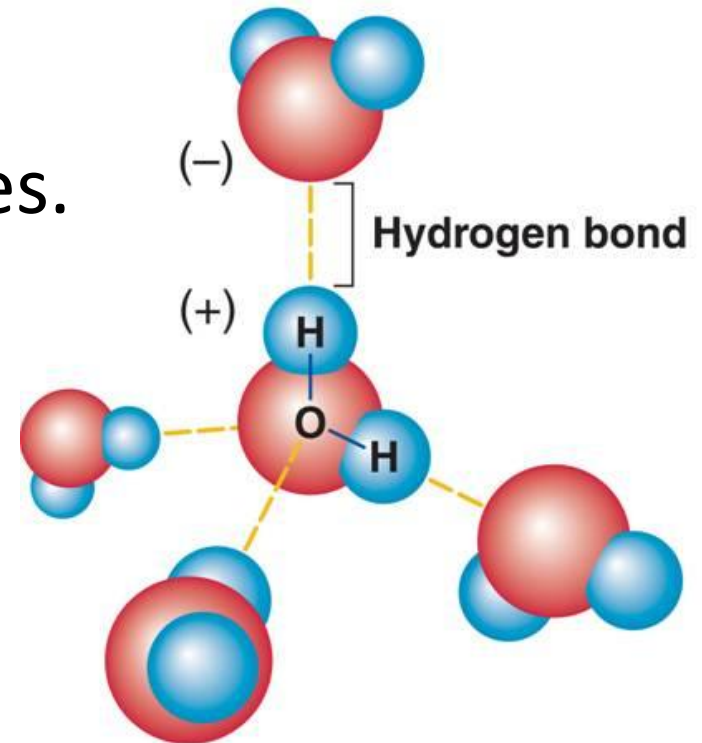
Attraction of Polar Molecules

- Polar molecules have 2 opposite poles, or ends
- A magnet has polarity (north & south), and these 2 ends attract each other
- Similarly, when a charged region of one molecule comes close to the oppositely charged region of another molecule, a weak attraction forms



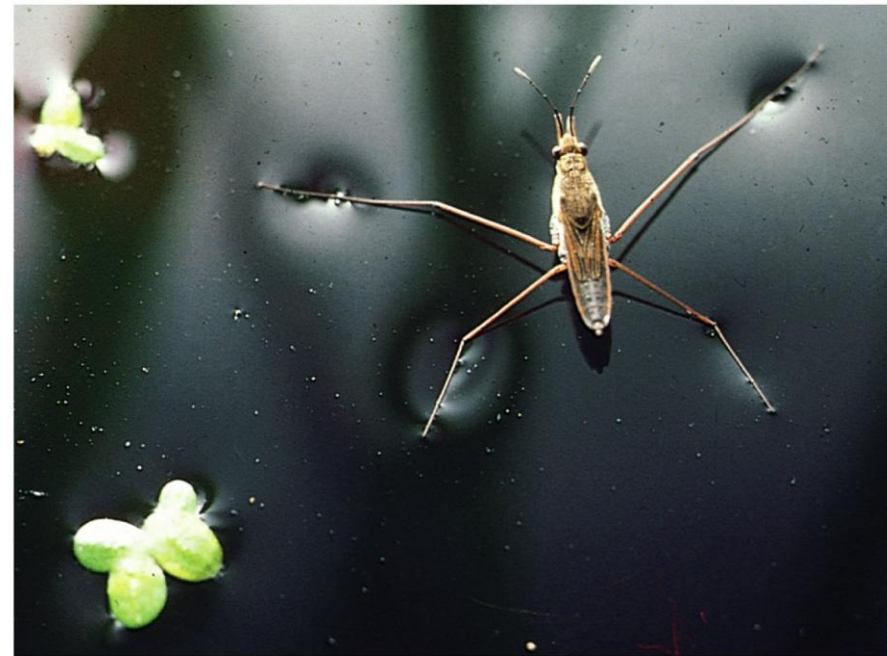
Hydrogen Bonds

- Opposites attract: polar molecules can attract each other and form HYDROGEN BONDS.
 - A magnet has polarity (north & south), and these 2 ends attract each other.
- Hydrogen bonds are weak attractions between molecules.



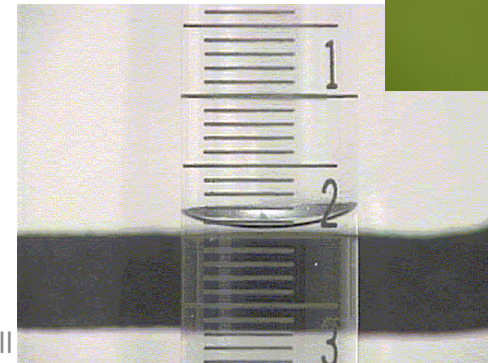
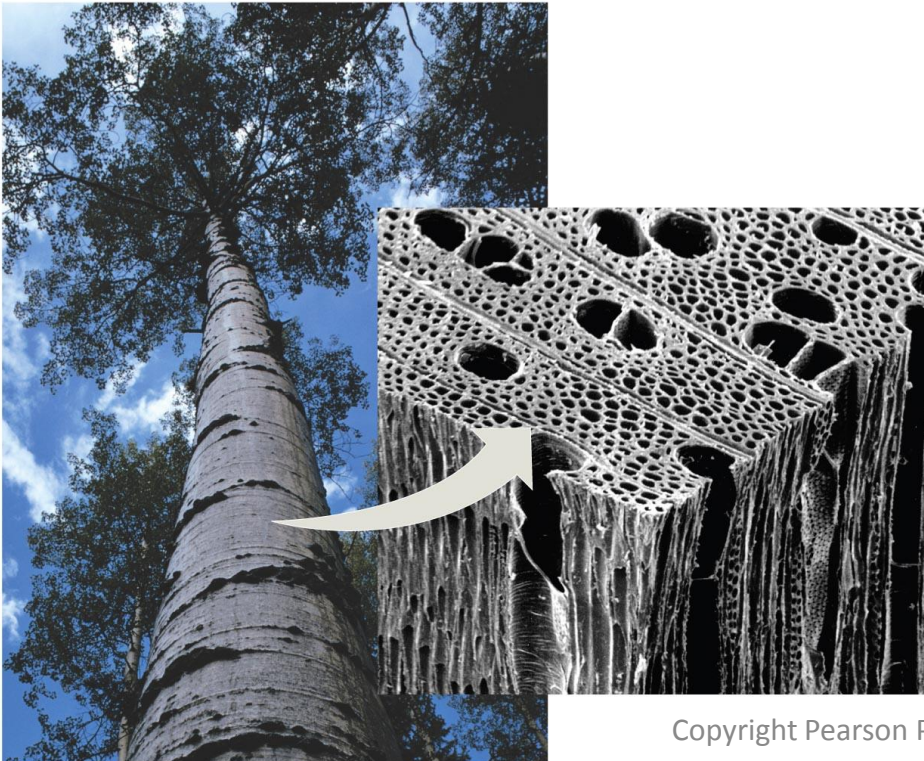
Cohesion

- **Cohesion:** an attraction between molecules of the same substance.
- Hydrogen bonding makes water very cohesive.
 - example: drop of water forming a bead on a smooth surface.
 - example: water holding insect on surface.



Adhesion

- **Adhesion:** an attraction between molecules of different substances.
 - example: **capillary action** - a force that draws water out of roots and up into a plants stems and leaves.



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Solutions and Suspensions

Mixture: a material composed of two or more elements or compounds that are physically mixed but not chemically combined.

Two types of mixtures can be made with water:

1. solutions
2. suspensions



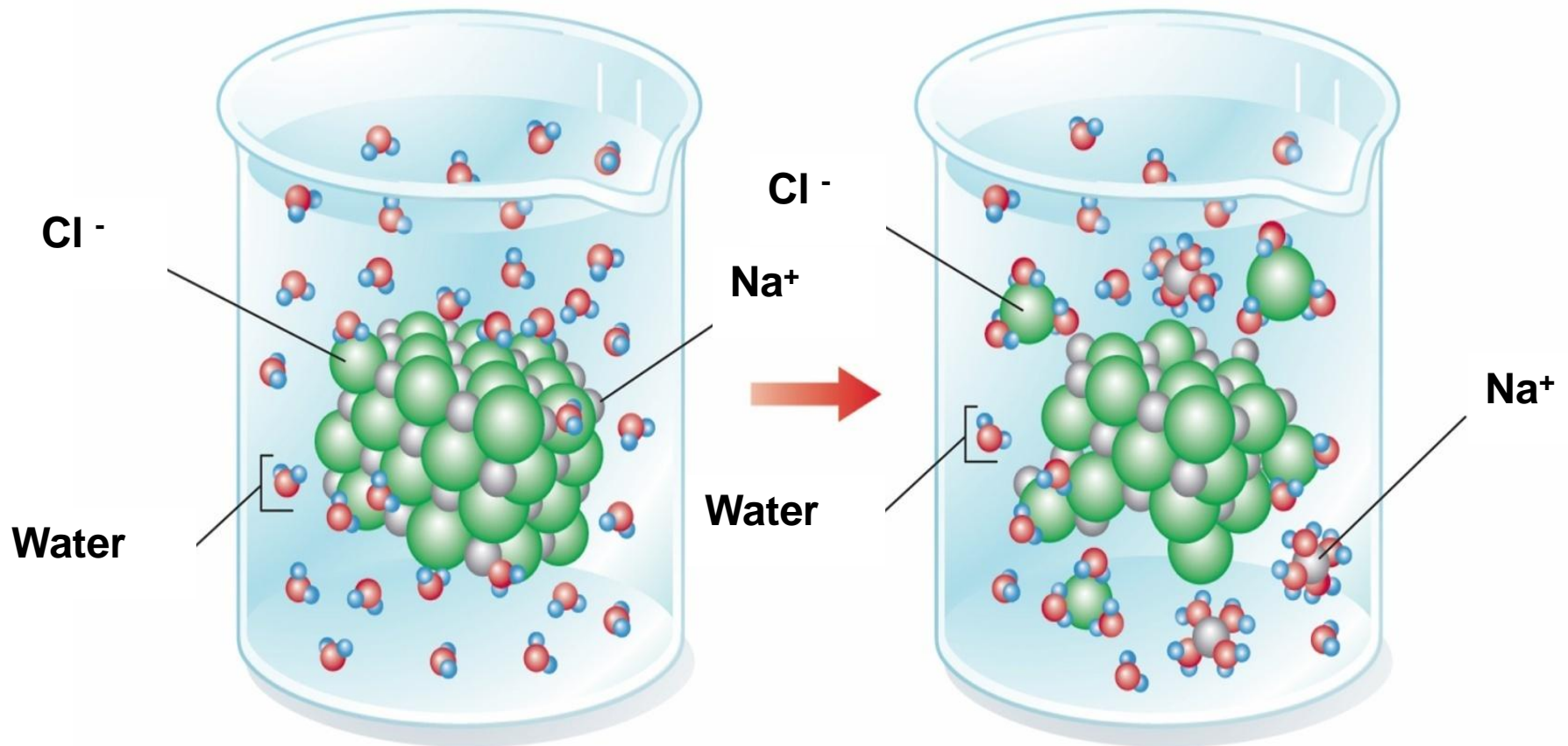
Solutions

- All the components of a solution are evenly distributed throughout the solution.
 - **Solute:** the substance that is dissolved.
 - **Solvent:** the substance in which the solute dissolves.



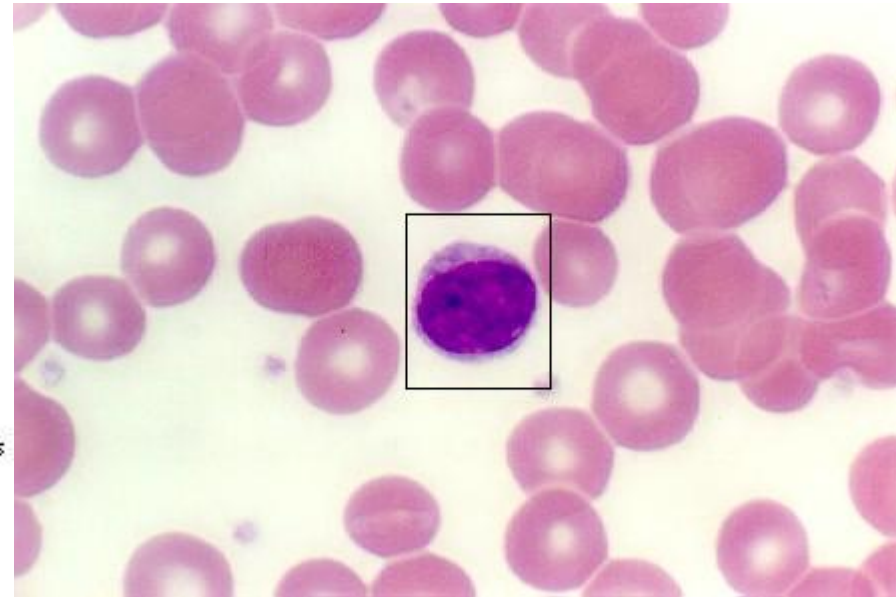
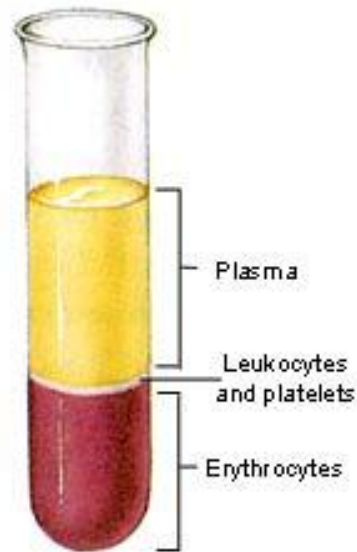
Solutions

- When a crystal of table salt is placed in warm water, sodium and chloride ions are attracted to the polar water molecules.



Suspensions

- Some materials do not dissolve when placed in water but separate into pieces so small that they do not settle out easily.



Acids, Bases, and pH

- A water molecule is neutral, but can react to form hydrogen and hydroxide ions.



The pH Scale

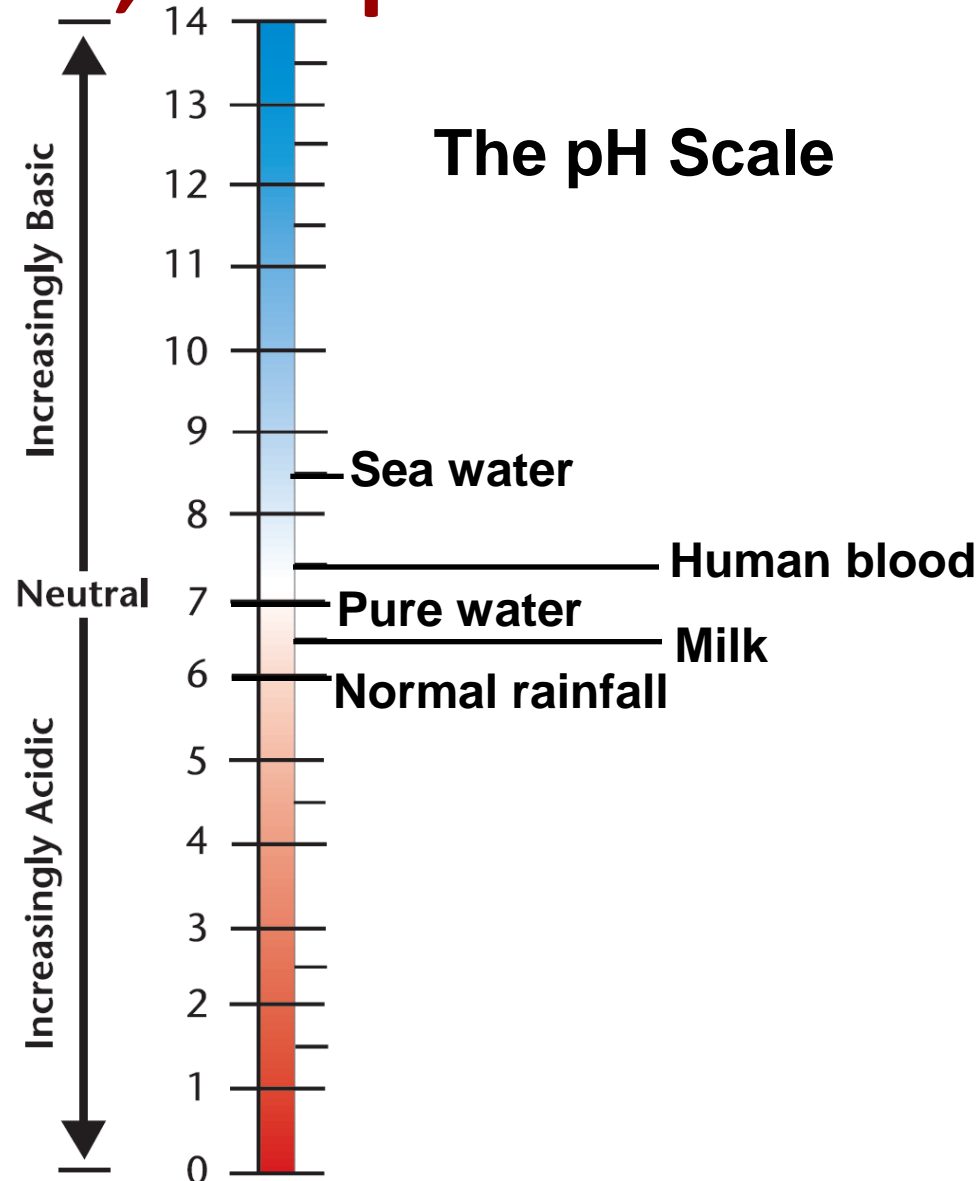
- The **pH** scale is a measurement system used to indicate the concentration of H⁺ ions in solution.
 - The pH scale ranges from 0 to 14.

The pH Scale



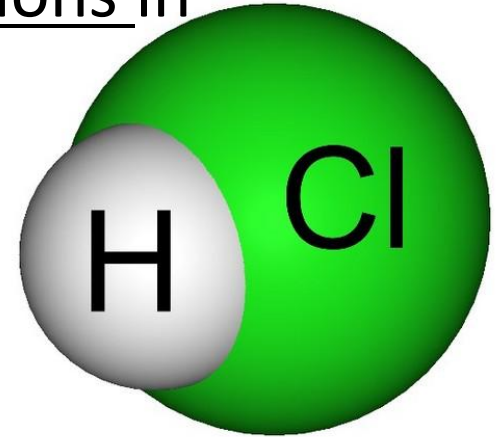
Acids, Bases, and pH

- At a pH of 7, the concentration of H^+ ions and OH^- ions is equal.

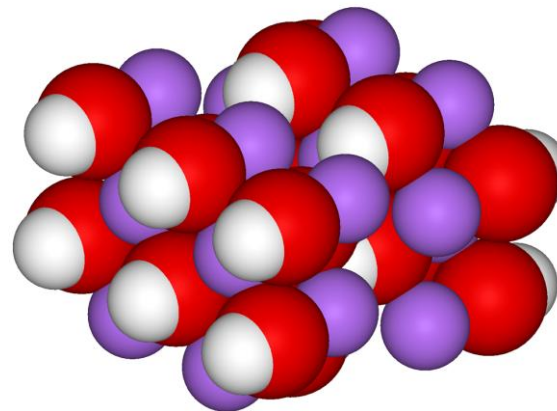


Acids & Bases

- An acid is any compound that forms H^+ ions in solution.



- A base is a compound that produces hydroxide ions (OH^- ions) in solution.



Acids, Bases, and pH

- **Buffers:** used to control/stabilize pH.
 - The pH of the fluids within most cells in the human body must generally be kept between 6.5 and 7.5.
- Controlling pH is important for maintaining homeostasis.

